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09/611,037	07/06/2000	Andras Kuthi	LAM1P077A	5329

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EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT PAPER NUMBER

1763

DATE MAILED: 06/04/2003

16

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/611,037

Applicant(s)

KUTHI ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 14-21 and 33-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-21 and 33-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 October 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 37-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "high aspect ratio" in claim 37 is a relative term which renders the claim indefinite. The term "high aspect ratio" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably appraised of the scope of the invention.

The use of the phrase "high aspect ratio" in claim 37, line 1 renders the claim indefinite in scope.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 33-35, 37-38, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al., U.S. Patent 5,593,540 in view of Admitted prior art.

Tomita et al. shows the invention substantially as claimed including in a chamber 1 for processing a semiconductor wafer W through plasma etching operations, the chamber being in an operational state and including a support chuck 61 for holding the semiconductor wafer, a RF power supply 12 for an upper electrode 3, a method of processing the wafer through plasma etching operations, comprising: striking a plasma in the plasma region in the chamber; and generating an increase in bias voltage/ion bombardment energy directed at a wafer surface of a semiconductor wafer W and a decrease in bias voltage directed at the top electrode 2, the top electrode 3 having a center region, a first surface, and a second surface, the first surface having an inlet 55 that is configured to receive processing gases from a source (71a,71b,71c) that is external to the chamber and facing a cooling plate 53 and flowing processing gases into the center region; the second surface facing the interior portion of the plasma chamber and having a plurality of gas feed line holes 55 that lead to a plurality of electrode openings which expose the gas to the plasma, wherein when a plasma is struck in the plasma region defined between the second surface and the wafer surface, the plasma

defines a first plasma sheath surface having a first plasma sheath surface area that is proximate to the wafer surface and a second plasma sheath surface area that is proximate to the second surface, the second plasma sheath surface area being greater than the first plasma sheath surface area (see figs. 1-4 and col. 3-line 40 to col. 5-line 60). Note that inherently the plasma sheath will form within the inlet openings 55 to form the second plasma sheath surface area since the openings have an opening diameter of 0.6mm (see applicant's specification at page 13, lines 22-24 and col. 5-lines 3-5 of Tomita et al.).

Tomita et al. fails to expressly disclose a pair of RF power sources. With respect to the dual RF power sources, admitted prior art in fig. 1A discloses a first RF power source 118b connected to a lower electrode and a second RF power source 118a connected to an upper electrode (see fig. 1A and page 1-line 24 to page 2-line 16 of specification). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Tomita et al. so as to include two RF power sources coupled to the upper and lower electrodes, respectively, because the Admitted prior art shows this to be a suitable structure for a plasma etching apparatus.

Claims 14-21, 36, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al., U.S. Patent 5,593,540 in view of Admitted prior art as applied to claims 33-35, 37-38, and 40 above, and further in view of Chang et al., U.S. Patent 4,854,263.

Tomita et al. and the Admitted prior art are applied as above but do not expressly disclose where the electrode opening diameters are greater than the gas hole feed diameters. Chang et al. discloses an electrode which has been formed so as to comprise gas feed holes 33 that lead to a plurality of electrode openings 31, the electrode openings having diameters that are greater than gas feed hole diameters of the plurality of gas feed holes in order to enhance dissociation and reactivity of the gas(es) (see col. 5-lines 33-53 and figs. 1-3). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Tomita et al. as to comprise electrode openings having diameters that are greater than gas feed hole diameters of the plurality of gas feed openings because this would enhance dissociation and reactivity of the gas(es).

Concerning claims 16-17 and 20, Tomita et al. and Chang do not disclose that the gas feed holes have a diameter of about 0.1mm, the electrode openings have a depth of 1/32 to 1/4 of an inch, and fixing a separation between the second plasma sheath surface having the second plasma sheath surface area and the second surface of the top electrode at about 0.5 to 5mm, but it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize through routine experimentation the gas feed hole diameter, the electrode opening depth, and the spacing of the second plasma sheath surface from the second surface depending upon, for example, the particular size of the semiconductor being processed, and therefore the claimed dimensions would not lend patentability to the claimed invention absent the showing of unexpected results.

With respect to claims 18-19, note that the electrode 2 is movable in the vertical direction (see col. 3-lines 40-51) and Tomita et al. contemplates the use of two buffer plates 51 and 52 (see col. 6-lines 40-55).

### ***Response to Arguments***

Applicant's arguments filed 4-30-03 have been fully considered but they are not persuasive. Applicant respectfully argues that the use of the term "high aspect ratio" in claim 37 does not render the claim indefinite. However, the examiner believes the use of the phrase still renders the claim indefinite because the instant specification does not provide a standard for ascertaining the requisite degree of the word "high", and therefore one of ordinary skill in the art would not be reasonably appraised of the scope of the invention. The use of this term in the Tomita et al. reference does not cure this problem because it is not clear whether the use of the term in this patent is meant to encompass the same aspect ratio or a different aspect ratio.

With respect to the use of the Tomita et al. reference, applicant argues that Tomita et al. fails to disclose or suggest generating an increase in bias voltage/ion bombardment energy directed at a wafer surface of a semiconductor wafer and a decrease in bias directed at the top electrode. The examiner respectfully submits that since, as taught by applicant, openings of 0.5mm or greater will form a plasma sheath (see page 13, lines 22-24 of applicant's specification), the 0.6mm openings in Tomita et al. will inherently produce the desired effect. As stated by applicant, it is as a result of this plasma surface formed within openings that creates the generating step as claimed.

Concerning applicant's argument that Tomita et al. is not combinable with Chang et al., the examiner respectfully disagrees. As stated above, the examiner believes it has been clearly shown that based upon statements in applicant's specification, plasma will form in the openings of Tomita et al.. Furthermore, a closer reading of Tomita et al. reveals that polymerization is reduced in the holes because of the flow rate of the gas and not because plasma does not pass into the holes (see col. 2-lines 37-53). Moreover, there is ample motivation provided in Chang et al. to combine this reference with the primary reference of Tomita et al., and this combination will not render Tomita et al. unsuitable for its intended purpose, since both references are directed to providing gas to a plasma chamber.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.




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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

  
Luz L. Alejandro  
Primary Examiner  
Art Unit 1763

June 3, 2003